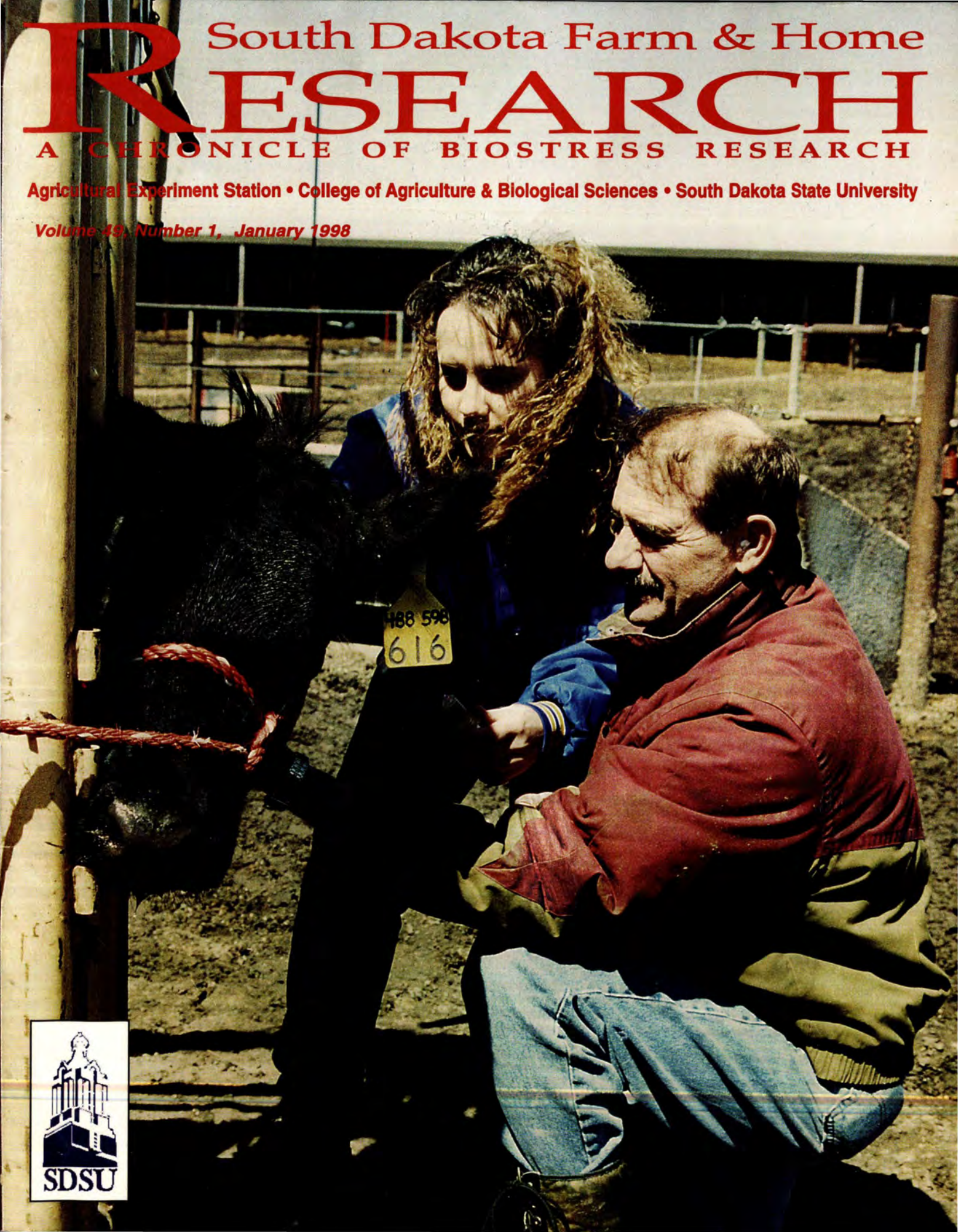
Winter 1-1998

South Dakota Farm and Home Research

South Dakota State University

South Dakota Farm & Home
RESEARCH
A CHRONICLE OF BIOSTRESS RESEARCH
Agricultural Experiment Station • College of Agriculture & Biological Sciences • South Dakota State University
Volume 49, Number 1, January 1998



Contents

About the Cover

Animal science researcher Herley Miller prepares an innoculation for a cow with assistance from Corale Headlee, May 1997 Animal Science graduate from Kadoka. Miller is helping collect data that will create a solid foundation for beef industry planning in South Dakota. Miller has high praise for South Dakota cow-calf producers, but sees the advantage of better record keeping. "We [South Dakota] are above average because we have better management programs...In southern states, common practice is that the bulls never come out of the cow pastures. How can those producers keep any records?"

photo: Tom Bare

South Dakota Farm & Home
RESEARCH
A CHRONICLE OF BIOSTRESS RESEARCH

Volume 49, number 1, January 1998

South Dakota State University
Peggy Gordon Elliot, President

College of Agriculture & Biological Sciences
David Bryant, Dean
Fred Cholick, Director, Agricultural Experiment Station
Mylo Hellickson, Director, Cooperative Extension Service
Eugene Arnold, Director, Academic Programs

Farm & Home Research Staff
Barbara Suhr Hartinger, Executive Editor
Mary Brashier, Editor
Larry Tennyson, Writer
Jerry Leslie, Writer
Michelle Rook, Writer
Jody Heemstra, Student Writer
Jennifer Hyde, Student Writer
Tom Bare, Photographer
Duane Hanson, Designer
Vergene Clark, Circulation Manager

Published quarterly by the Agricultural Experiment Station, College of Agriculture & Biological Sciences, South Dakota State University, Brookings, South Dakota. Sent free to any resident of South Dakota in response to a written request.

South Dakota Farm & Home Research is edited and designed in the Department of Ag Communications, SDSU, and printed on campus at the SDSU Printing Laboratory.

http://www.abs.sdstate.edu

Published in accordance with an act passed in 1881 by the 14th Legislative Assembly, Dakota Territory, establishing the Dakota Agricultural College and with the act of re-organization passed in 1887 by the 17th Legislative Assembly, which established the Agricultural Experiment Station at South Dakota State University. South Dakota State University is an Affirmative Action/Equal Opportunity Employer (Male/Female) and offers all benefits, services, education and employment opportunities without regard for ancestry, age, race, citizenship, color, creed, religion, gender, disability, national origin, sexual preference, or Vietnam Era veteran status.

5,000 printed by the AES at a cost of 57¢ each. January 1998. AX036

Printed with AgriTek ink, containing soy, corn, and other vegetable oils.

Director's comments

The 'how' and 'what' change, the 'why' is our guide

by Fred A. Cholick

photo: Tom Bare

Experiment Station Director Fred Cholick (right) examines soybean cyst nematode with Jim Smolik, researcher in the Plant Science department at SDSU. Smolik has developed strategies farmers can use to combat the nematode in their fields.

Somebody once said that change is the only constant in life. Had we been around in 1887 when the South Dakota Agricultural Experiment Station started up, I don't think any of us could have imagined the changes that were going to occur in agriculture in the next 111 years.

Think of it: From oxen and horses to tractors to lights on tractors (an event with more far-reaching consequences than you might think). From lanterns to electricity and computers and internet access on the farm. From rock-lined wells, buckets, and rainwater cisterns to rural water on tap. From home butchering to shrink-wrapped cuts in the meat counter. From wheat yielding 4 to 6 bu/A to over 30 bu/A.

And think ahead: Can we possibly imagine the changes that will take place in South Dakota agriculture in the next 111 years?

Your Ag Experiment Station has kept pace with change. We have, in fact, initiated much of it.

The stories in this issue of our magazine illustrate this:

• New varieties. They offer higher and more stable yields, or greater pest resistance, or maybe they're just more beautiful and useful around the homestead.

• New discoveries of plant pests and our recommendations on how to handle them. We've been expecting the soybean cyst nematode for years, because it occurs in neighboring states. It's here. Our plant scientist says "practice the three R's," recognizing the nematode, rotating crops, and using resistant varieties. In the midst of all that's new in the 1990s, two of those R's remind us that the cropping diversity and rotations our fathers practiced are still valid.

• New work with isoflavones from soybeans. Our researchers tell us this work has a degree of urgency attached to it because, on one side, soybeans are one of our leading crops and we always need to be looking for additional, profitable markets. On the other side, they say our state ranks among the top 10 in incidence of high blood pressure and heart disease, which these isoflavones can help prevent.

• New class offerings. There is no book or tool that teaches the ability to direct change to our advantage as well as the experience students gain when they stand before their classmates and defend their beliefs. Senior seminars offer students the chance to expand their thinking, to grasp the concept that agriculture is now global agriculture. These classes, often taught by our researchers, may rival any of the other changes our college initiates because they affect humans directly.

In the midst of change, however, we are still the same.

While the activities and work of the Agricultural Experiment Station have adjusted to meet the changing needs of today's agriculture, our basic, underlying principles and philosophy have been rock-solid over 111 years. We are here to serve, to conduct research that develops knowledge that will solve problems and questions in all facets of agriculture. Through discoveries and dissemination of knowledge, we help the people of South Dakota and the citizens of the nation provide an affordable, dependable, and safe food and fiber supply from farms and ranches where natural resources are sustained and regenerated.

Another unchanging principle is our commitment to a land-grant university where research, Extension, and teaching form a collaborative partnership. The product of that partnership is unbiased information, provided to students in classrooms and citizen students on the farmsteads and towns and cities of South Dakota. We have also formed partnerships with various agribusinesses, and we welcome the assistance of the agricultural industry. Whatever the partnership, you can also believe that our research results will be presented as unbiased, straightforward information.

Change is constant and challenges are never-ending. You have our guarantee that the South Dakota Agricultural Experiment Station will follow this unchanging rule: We will continue to meet the needs of the citizens of South Dakota, the region, and the nation. ❑

Cross-college research team knows state's cow-calf producers are No. 1. Now they're out to ...

Prove it

by Mary Brashier

photo: Tom Bare

A trio of SDSU scientists doesn't doubt for a minute that South Dakota cow-calf producers are tops in the nation—even though they still lack the precise data to prove it.

In production and in marketing, "we absolutely knock home runs," said Eddie Hamilton, Extension veterinarian and teacher, who will collect most of that supporting information.

"South Dakota and the northern states far exceed the national average in calf production. We have a very fertile cow herd, and we wean a higher percent of our calves. They are growthy, they have good genetics, and they're heavier than the national calf herd."

And on the marketing side, "the highest priced calves in the nation are at sale barns in South Dakota and Nebraska. They top the market every time," he added.

The clinker is cost containment, Hamilton said. The consolation is that no other state has a handle on it either.

Obviously, in South Dakota, wintering costs are higher than the national average. The common wisdom is that next spring's upcoming calving rate will not be all that great. But the problem of cost management goes deeper. "We've set our sights on 'maximum' and not 'optimal' returns," Hamilton said.

Hamilton cited operators who have deliberately settled for a 77% weaning rate, well below the 84% national average. "These producers penciled it out and find they are in a better economic position than if they were trying to squeeze every last penny out of their animals. Those last pennies come at too high a price.

"We cannot look at production alone to measure profitability."

But production is where cow-calf profits start.

Credit for South Dakota's position in production goes largely to research and Extension efforts at SDSU, said the newcomer from Texas and most recently Nebraska. He admits to wearing a path from his building—Veterinary Science—to the Animal Science Complex next door to confer with colleagues.

One of those is Dick Pruitt, who conducts beef cow research at the Cottonwood Research Station. Another is Herley Miller, teacher/researcher working with hormones to promote earlier cycling in cows and heifers . Miller's goal is to "keep 365 days in a reproductive year. We have 'one-year' calving intervals of 375 or 400 days."

Feed takes the largest single bite out of a producer's wallet, Pruitt said.

"The information out there says that people who make more money tend to have slightly higher reproductive performance and they do it with lower feed costs," he said.

Pruitt will be working with Hamilton and has set some high standards for the new Extension specialist.

"When it comes to herd production and financial records, Dr. Hamilton is one of the real leaders in the country," Pruitt said. "With him on board there is an increased opportunity for cow-calf producers to collect and evaluate reliable measures of cow herd performance and production costs. This will help us get a better picture of the beef industry in South Dakota."

Pruitt said the critical nutritional periods for beef cows are after calving and the 60 days prior to calving. "The management challenge is to balance the need of the cow for high nutrition so that she achieves high reproductive performance with the need of the producer to reduce winter feed costs."

His research at the Cottonwood Station near Philip has been aimed at nutrition and management to reduce costs while maintaining or improving reproductive performance. His results indicate that cow body condition scores can be used to adjust winter nutrition to satisfy the cow's needs.

"Bring those cows along so they are a condition 5 by the end of the winter

← Dick Pruitt and Herley Miller of the Animal and Range Sciences Department are part of the team of SDSU researchers gathering data on cow herd performance and production costs to develop a clear picture of the beef industry in South Dakota. They have a good idea of what they'll find. For example: "There's five or six South Dakota counties out around the River with the classiest cows anywhere in the country. They've got good genetics, better nutrition, top breeding programs—the whole works," says Miller.

feeding period," Pruitt said. "Critical times to evaluate condition are at the beginning of the winter feeding period, at calving time, and at beginning of the breeding season."

Condition 5 photos show outlines of one or two rear ribs and just barely indicate the outline of the spine.

Other studies at Cottonwood demonstrate that when cows consume mature, low-protein feeds such as dormant native range, protein must be the key supplement. Grain actually reduces cow performance unless adequate protein is also provided.

In his current study, Pruitt is evaluating the potential for moving the calving season from March to May and weaning 45 days earlier than the traditional late October weaning date to further reduce feed costs.

Miller also has high praise for South Dakota cow-calf producers, agrees that the state is above the national average in production, but deplores the present lack of data to support such statements beyond any possible debate.

"We are above average because we have better management programs. Maybe the point is that we have management programs in the first place. In southern states, common practice is that the bulls never come out of the cow pastures. How can those producers keep any records? And we have better animals than even the other northern states like Nebraska.

"There's five or six South Dakota counties out around the River with the classiest cows anywhere in the country. They've got good genetics, better nutrition, top breeding programs—the whole works."

He's pretty confident about the calving rates these ranchers report. He wouldn't say that about everybody.

"I've heard knowledgeable folks reporting calving rate on only those cows they kept in the herd after they culled out and sold the ones that were open.

"Calving rate isn't supposed to reflect how good you are at palpating cows to determine if they're pregnant. Calving rate is the number of calves born per cow exposed to the bull."

The cow has only about 35 days in which to become pregnant if she is to keep to the 365-day calving interval that is the goal of good producers.

"That's not even two cycles," Miller commented. "So here's where nutrition comes into play. If the cow's not properly fed that last trimester of pregnancy and during early lactation, she's not going to cycle early or she'll drag out the interval. We've known that for years."

Heifers complicate the issue.

"We want heifers to come into heat earlier, so that their first breeding happens when they are at about 65% of mature body weight. The earlier a heifer breeds in her first breeding season, the more efficient she's likely to be for the rest of her life."

"The highest priced calves in the nation are at sale barns in South Dakota and Nebraska. They top the market every time."

—Dr. Eddie Hamilton
Extension Veterinarian, SDSU

The level of nutrition affects the level of estrus-initiating hormones the cow's body produces. When producers want to shorten the breeding season or concentrate calving and produce a more uniform calf crop, they can feed, inject, or implant these hormones.

To shorten the estrous cycle, Miller and his students prefer to give MGA (melengestrol acetate) in feed. "MGA has been around for 20 years or so, it's cheap, and you can get it from the feed dealer.

"An implant, on the other hand, requires more work to insert it and then to take it out again. It's more expensive—$6 or $7 per animal—whereas MGA is about 5 to 7 cents a day for 14 days. Since producers aren't using implants for those reasons, why should we spend the time and effort on them ourselves if MGA works just as well?"

It does, on cows. They cycle nearly perfectly, Miller said. Heifers, again, are more of a problem in estrous cycle induction with MGA.

"We think we need something in there to help the heifer into her first cycles. So we're adding an injection this year of GNRH (gonadotropin releasing hormone), which is a hormone from the brain. If the injection-MGA combination works, it's still better than implanting." He and his students schedule blood samples from a special group of cattle every 15 minutes during estrus to look for fluctuations in hormone levels and to find best times to administer injections.

Miller offers a math exercise to his students to dramatize the potential economic benefits of maintaining a yearly calving interval.

"Say one cow conceives on time, during the first estrus after calving, and produces a calf every 365 days. Another cow has a 10-day longer time each year to conception. Assume all calves in the herd gain 1 3/4 pound per day. The first cow's calf will have 10 more days to put on weight each year and will weigh 17 1/2 pounds more at weaning year one and 105 pounds more the seventh year. That's dollars and cents to the producer."

Hamilton finds very few differences between large- and small-scale operators or between high-cost and low-cost cow-calf

Cross-college research team knows state's cow-calf producers are No. 1. Now they're out to ...

Prove it

by Mary Brashier

photo: Tom Bare

A trio of SDSU scientists doesn't doubt for a minute that South Dakota cow-calf producers are tops in the nation—even though they still lack the precise data to prove it.

In production and in marketing, "we absolutely knock home runs," said Eddie Hamilton, Extension veterinarian and teacher, who will collect most of that supporting information.

"South Dakota and the northern states far exceed the national average in calf production. We have a very fertile cow herd, and we wean a higher percent of our calves. They are growthy, they have good genetics, and they're heavier than the national calf herd."

And on the marketing side, "the highest priced calves in the nation are at sale barns in South Dakota and Nebraska. They top the market every time," he added.

The clinker is cost containment, Hamilton said. The consolation is that no other state has a handle on it either.

Obviously, in South Dakota, wintering costs are higher than the national average. The common wisdom is that next spring's upcoming calving rate will not be all that great. But the problem of cost management goes deeper. "We've set our sights on 'maximum' and not 'optimal' returns," Hamilton said.

Hamilton cited operators who have deliberately settled for a 77% weaning rate, well below the 84% national average. "These producers penciled it out and find they are in a better economic position than if they were trying to squeeze every last penny out of their animals. Those last pennies come at too high a price.

"We cannot look at production alone to measure profitability."

But production is where cow-calf profits start.

Credit for South Dakota's position in production goes largely to research and Extension efforts at SDSU, said the newcomer from Texas and most recently Nebraska. He admits to wearing a path from his building—Veterinary Science—to the Animal Science Complex next door to confer with colleagues.

One of those is Dick Pruitt, who conducts beef cow research at the Cottonwood Research Station. Another is Herley Miller, teacher/researcher working with hormones to promote earlier cycling in cows and heifers . Miller's goal is to "keep 365 days in a reproductive year. We have 'one-year' calving intervals of 375 or 400 days."

Feed takes the largest single bite out of a producer's wallet, Pruitt said.

"The information out there says that people who make more money tend to have slightly higher reproductive performance and they do it with lower feed costs," he said.

Pruitt will be working with Hamilton and has set some high standards for the new Extension specialist.

"When it comes to herd production and financial records, Dr. Hamilton is one of the real leaders in the country," Pruitt said. "With him on board there is an increased opportunity for cow-calf producers to collect and evaluate reliable measures of cow herd performance and production costs. This will help us get a better picture of the beef industry in South Dakota."

Pruitt said the critical nutritional periods for beef cows are after calving and the 60 days prior to calving. "The management challenge is to balance the need of the cow for high nutrition so that she achieves high reproductive performance with the need of the producer to reduce winter feed costs."

His research at the Cottonwood Station near Philip has been aimed at nutrition and management to reduce costs while maintaining or improving reproductive performance. His results indicate that cow body condition scores can be used to adjust winter nutrition to satisfy the cow's needs.

"Bring those cows along so they are a condition 5 by the end of the winter

← Dick Pruitt and Herley Miller of the Animal and Range Sciences Department are part of the team of SDSU researchers gathering data on cow herd performance and production costs to develop a clear picture of the beef industry in South Dakota. They have a good idea of what they'll find. For example: "There's five or six South Dakota counties out around the River with the classiest cows anywhere in the country. They've got good genetics, better nutrition, top breeding programs—the whole works," says Miller.

feeding period," Pruitt said. "Critical times to evaluate condition are at the beginning of the winter feeding period, at calving time, and at beginning of the breeding season."

Condition 5 photos show outlines of one or two rear ribs and just barely indicate the outline of the spine.

Other studies at Cottonwood demonstrate that when cows consume mature, low-protein feeds such as dormant native range, protein must be the key supplement. Grain actually reduces cow performance unless adequate protein is also provided.

In his current study, Pruitt is evaluating the potential for moving the calving season from March to May and weaning 45 days earlier than the traditional late October weaning date to further reduce feed costs.

Miller also has high praise for South Dakota cow-calf producers, agrees that the state is above the national average in production, but deplores the present lack of data to support such statements beyond any possible debate.

"We are above average because we have better management programs. Maybe the point is that we have management programs in the first place. In southern states, common practice is that the bulls never come out of the cow pastures. How can those producers keep any records? And we have better animals than even the other northern states like Nebraska.

"There's five or six South Dakota counties out around the River with the classiest cows anywhere in the country. They've got good genetics, better nutrition, top breeding programs—the whole works."

He's pretty confident about the calving rates these ranchers report. He wouldn't say that about everybody.

"I've heard knowledgeable folks reporting calving rate on only those cows they kept in the herd after they culled out and sold the ones that were open.

"Calving rate isn't supposed to reflect how good you are at palpating cows to determine if they're pregnant. Calving rate is the number of calves born per cow exposed to the bull."

The cow has only about 35 days in which to become pregnant if she is to keep to the 365-day calving interval that is the goal of good producers.

"That's not even two cycles," Miller commented. "So here's where nutrition comes into play. If the cow's not properly fed that last trimester of pregnancy and during early lactation, she's not going to cycle early or she'll drag out the interval. We've known that for years."

Heifers complicate the issue.

"We want heifers to come into heat earlier, so that their first breeding happens when they are at about 65% of mature body weight. The earlier a heifer breeds in her first breeding season, the more efficient she's likely to be for the rest of her life."

> *"The highest priced calves in the nation are at sale barns in South Dakota and Nebraska. They top the market every time."*
>
> —Dr.Eddie Hamilton
> Extension Veterinarian, SDSU

The level of nutrition affects the level of estrus-initiating hormones the cow's body produces. When producers want to shorten the breeding season or concentrate calving and produce a more uniform calf crop, they can feed, inject, or implant these hormones.

To shorten the estrous cycle, Miller and his students prefer to give MGA (melengestrol acetate) in feed. "MGA has been around for 20 years or so, it's cheap, and you can get it from the feed dealer.

"An implant, on the other hand, requires more work to insert it and then to take it out again. It's more expensive—$6 or $7 per animal—whereas MGA is about 5 to 7 cents a day for 14 days. Since producers aren't using implants for those reasons, why should we spend the time and effort on them ourselves if MGA works just as well?"

It does, on cows. They cycle nearly perfectly, Miller said. Heifers, again, are more of a problem in estrous cycle induction with MGA.

"We think we need something in there to help the heifer into her first cycles. So we're adding an injection this year of GNRH (gonadotropin releasing hormone), which is a hormone from the brain. If the injection-MGA combination works, it's still better than implanting." He and his students schedule blood samples from a special group of cattle every 15 minutes during estrus to look for fluctuations in hormone levels and to find best times to administer injections.

Miller offers a math exercise to his students to dramatize the potential economic benefits of maintaining a yearly calving interval.

"Say one cow conceives on time, during the first estrus after calving, and produces a calf every 365 days. Another cow has a 10-day longer time each year to conception. Assume all calves in the herd gain 1 3/4 pound per day. The first cow's calf will have 10 more days to put on weight each year and will weigh 17 1/2 pounds more at weaning year one and 105 pounds more the seventh year. That's dollars and cents to the producer."

Hamilton finds very few differences between large- and small-scale operators or between high-cost and low-cost cow-calf

operators in production skills. Any one of them can be very good at producing meat, he says.

"But if you look at cost, then there could be a two- to three-fold difference. The cost containing producer may have a $200 annual cow cost while another is spending over $700 per cow, all for the same level of production," he said.

Hamilton works with individual producers to offer specific recommendations. Already he's found that his South Dakota clients "are truly good operational managers. They take care of the day-to-day business.

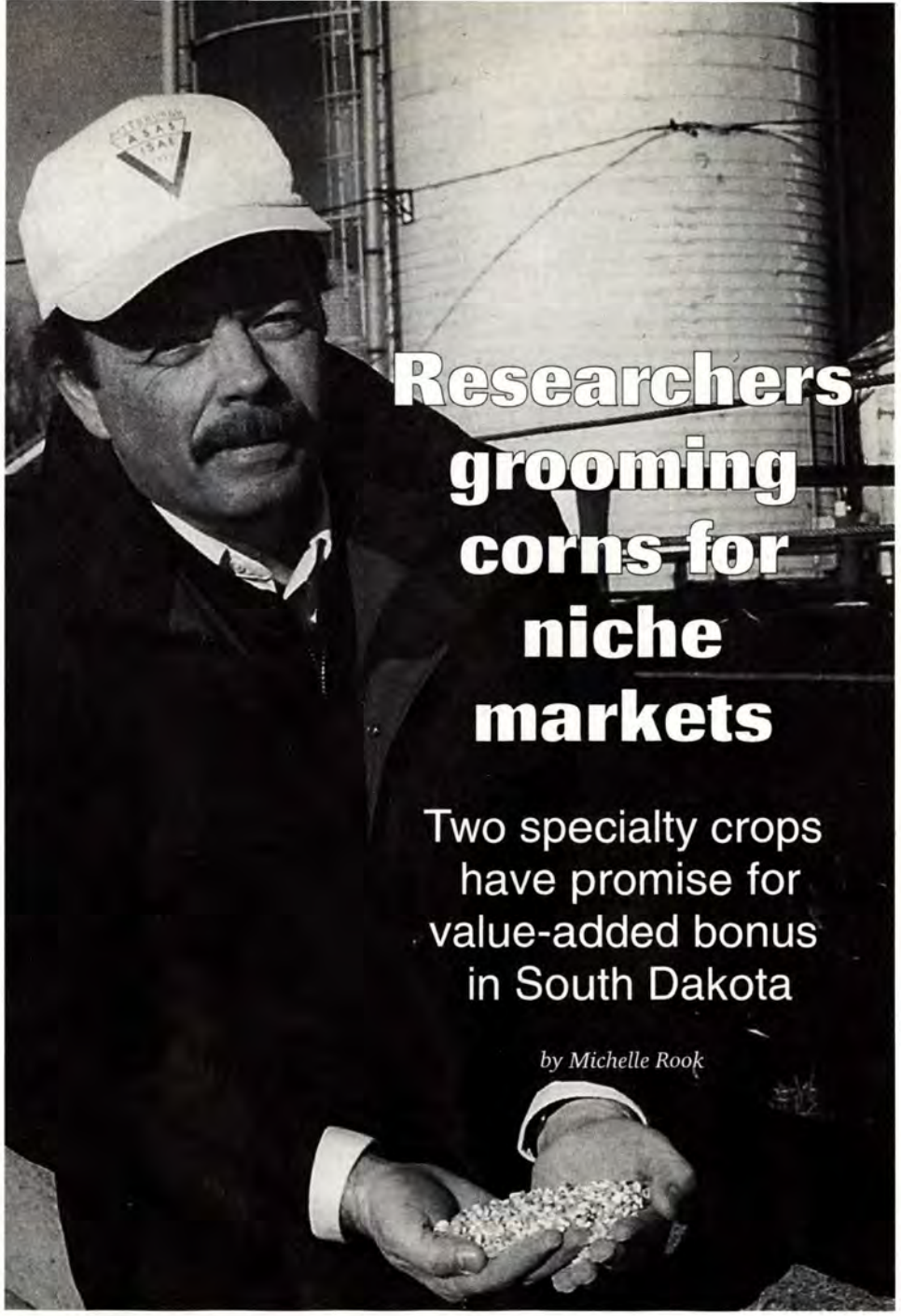
"But often there's no one in the family managing the assets, looking at the overview or the investment angle. We have to manage the whole system—the production, finance, and the natural and human resources as a unit."

Most often overlooked in the mix, he suspects, is the human resource, and he would like to gather enough information to be able to dissect that resource into "management descriptors" that would be measurable and useful characteristics of successful beef producers.

It's a daunting job. "History would say that there are individuals who intuitively just make good decisions. We can't teach that process, but maybe we can teach people how to mimic it."

If he succeeds, a "management assessment category" may be added to the criteria in the Standardized Performance Analysis (SPA) program of the National Cattlemen's Beef Association. South Dakota cow-calf producers will not only be on top; they will have the figures to prove it. ❑

Biostress challenge: keeping South Dakota "first" in cow-calf production despite state's weather extremes



Researchers grooming corns for niche markets

Two specialty crops have promise for value-added bonus in South Dakota

by Michelle Rook

photo: Tom Bare

Carl Birkelo, animal nutritionist, expects to see feed efficiency improve, perhaps as much as 5%, when he tests high-oil corn in steer finishing diets. High-oil corn could be valuable in wintering diets, he says, since beef cattle need additional energy at this time of the year.

Specialty crops like high-oil corn or white corn hold out the promise of fitting into a niche market for South Dakota producers.

SDSU researchers are working on several projects to find the best ways to produce and utilize these crops in this area, since they have typically been grown in states farther south. The research is being supported by the South Dakota Corn Utilization Council.

Carl Birkelo, Animal and Range Sciences Department, is looking at the utilization of high-oil corn in finishing diets for feedlot cattle and at the effect processing has on utilization. Over the last 10 years, research has been conducted on poultry, swine, and dairy, but only recently did researchers start looking at beef cattle.

Producers are showing more interest in growing high-oil corn. "Nationally, there wasn't any high-oil corn grown in 1993, but by 1997 that figure grew to one million acres," Birkelo said. The interest comes primarily from the potential advantages high-oil corn offers as a feedstuff.

In the feeding trial at the Southeast Research Farm, Beresford, high-oil corn raised on the farm will be fed to 162 steers in a standard 120-day finishing diet. The diet will have 80 to 85% high-oil corn and 10% ground alfalfa hay.

Effects on performance are uncertain, but if the corn contains 6 to 7% oil as expected, Birkelo expects at least an improvement in feed efficiency, maybe on the order of 2 to 5%. This would be similar to what happens when fat is added to the diet because of increased energy density.

Ruminant animals utilize the oil in the corn differently than pigs, Birkelo said. "Too much oil can interfere with a beef animal's digestion, but since it's contained inside the corn kernel it does not come in direct contact with the bacteria in the rumen, and more fat can be added to the diet."

For this reason, Birkelo is also looking at how processing will impact digestibility. He will compare both whole and rolled corn.

Birkelo sees the potential advantage of high-oil corn in wintering diets, because this is when beef cattle need more digestible energy. Adding oil is one way to get that added energy. "The bottom line is we need to determine how much more is high-oil corn worth compared to regular corn and what level should we be feeding the diet to get the best feed efficiency."

Seed companies have really gotten into value-added seed products, Birkelo said, and they open up a lot of options for producers. These products are end-user driven. "They do it because it's worth something to both crop and livestock producers," he said.

However, high-oil corn will change the way some feedstuffs are traded and will necessitate a "juggling act" for elevators.

Bob Berg, manager of the Southeast Research Farm, is looking at whether raising high-oil corn is feasible in South Dakota. Composition or oil content of the crop may vary depending on the environment. He said that for high-oil corn to pay it needs to be agronomically sound, maintain its quality, and be priced so that it is profitable to raise and feed to livestock.

Berg ran two field trials, covering 52 acres, to compare the performance of a high-oil corn hybrid (Pioneer 34M55) with 110-day maturity with a popular conventional hybrid (Pioneer 3489) with 108-day maturity. The crop was harvested with a GPS yield monitor to evaluate hybrid performance and seeding rates. Silage and high-moisture shelled corn samples were also ensiled to measure their quality.

Berg found some yield drag with the high-oil corn. "We saw a 20- to

Zeno Wicks III, believes white corn has high potential in South Dakota because of the popularity of Mexican foods. "Growing conditions here are ideal" for the crop, says the corn breeder who hopes to develop a hybrid with high performance and the maturity to fit the state's shorter summers.

photo: Tom Bare

30-bushel per acre yield decrease in the high-oil corn compared to conventional corn." However, Berg said precipitation was limited at the farm during the summer and yields were lower than in past years. Second and third generation corn borer infestations also caused moderate damage late in the season. The high-oil hybrid lodged more and had more ear droppage than the other hybrid.

The high-oil corn was also about 1 to 2% wetter when harvested, said Berg. Pioneer is running laboratory analysis on the grain for oil content and feed value.

Producers in South Dakota are interested in planting high-oil corn, according to Berg. However, they need to examine the yield potential, livestock performance, and carefully consider any premium, discount, or other contract conditions before they jump in with both feet.

Berg figured the economic return from the trial at the Southeast Farm. "After subtracting out input costs, which were similar per acre between the hybrids, the high-oil corn resulted in $60 per acre less return than the conventional corn." This was not figuring in any premium.

Berg said there are a few high-oil hybrids available for southeastern South Dakota. Breeders are working on varieties with shorter day lengths that still yield well farther north.

Ben Fuller, general manager of the Minnkota Farmers Cooperative in Jasper, Minn., said most producers grow high-oil corn under a contract. His elevator contracts with Continental Grain, and they have established a market for export on the West Coast. Elevators in South Sioux City, Iowa, and Emery, S.D., are also setting up contracts.

Farmers are paid a premium for the specialty corn. "That amounts to a starting point of 10 cents for 6% oil and then a penny every tenth of percent higher than that, up to 25 cents for 7.5% oil," Fuller said. Currently, not much high-oil corn is grown in the upper Midwest, but he said it is gaining the attention of producers who want to feed it to their livestock.

In the near future, SDSU researchers hope to test high-oil corn in swine diets.

White food corn is another specialty corn being tested in South Dakota. Corn breeder Zeno Wicks III said there is a great deal of potential for this crop because of the increasing popularity of Mexican food. White corn can also be fed to cows or pigs.

Wicks said there are two types of uses for white corn. One is dry milling, where a portion of the corn kernel is processed for products like corn flakes or grits. The other is masa flour which utilizes the whole kernel of corn for products like tortilla chips and other snack foods.

Masa flour production has the best potential in South Dakota, according to Wicks, because the whole kernel is used. "As you move from the southeastern states to the northwest, the quality of the white corn kernel goes down." What happens is the hardness and the ratio of endosperm to embryo in the kernel decreases. However, masa flour uses the whole kernel and quality is not as much of a concern.

While quality is a concern in South Dakota, Wicks said growing conditions here are ideal for white corn production. "Because our corn is bred with loose husks, it can be produced relatively free of aflatoxins or mold. This is not true in states farther south which have high humidity and plant corn with tight husk," he said.

Wicks and Pat Beauzay, research associate, are testing existing varieties of white corn and trying to develop a hybrid line that is suitable for South Dakota, planting eight commercial and seven experimental white corn hybrids with two yellow hybrids for comparison in the spring of 1997.

"We tried to find the earliest hybrids available to determine if there was one that would work in South Dakota," said Beauzay. The yield trials were conducted at Beresford, Armour, and on an irrigated site at Pierre. The earliest corn they could find was 105-day corn, which pushes the limits for much of the state. Most producers need a 90-day corn.

Beauzay said the results are promising. "At all three locations, the white corn hybrids compared very closely with yellow (conventional) hybrids in yield and test weight," he said. They also determined there are varieties that will work in the southeast corner of the state where the growing season is longer.

Wicks said they have 20 new hybrids to test next year. "We would like to develop a cross that will have high performance but still have the maturity to work in South Dakota," he said. If they come up with new hybrids they will be marketed by the companies cooperating in the research.

The breeding program is on-going, according to Wicks, and the goal is to develop a new public variety of white corn at SDSU. The time table is about 5 years.

Producers who grow white corn typically contract with a company like Quaker Oats or Frito Lay, Wicks said. "The premium ranges from $.60 to $1.10 a bushel, depending on the availability of the market."

Currently some producers in South Dakota are growing white corn, but there are no contracts with those companies. If producers eventually build their own processing facility they could get a contract with the plant.

The nice part about this specialty crop, according to Wicks, is that it does not take a big change in the farmer's production system. "The inputs are the same, and producers can use their existing corn planter and harvest equipment."

He cautions that producers need to use an economical variety. Hybrids are not currently available to get the yields needed, and producers can not afford a 10 to 15% yield reduction. ❑

Biostress challenge:
providing new corns for premiums in new markets

photo: Tom Bare

Oats are a small grain in the rotation, a cash crop in midsummer, an on-farm livestock feed, and a healthy human food. Keeping one step ahead of the diseases, which eventually adapt to varieties grown for some years, Dale Reeves, SDSU oat breeder, has developed and released many new lines. Lately his new oats have been large kerneled and white hulled, designed especially for the horse market niche.

New varieties boost economy

Development of new plants is a genuine pocketbook issue for state's towns, farms

by Jerry Leslie

New and improved plant varieties continue to stream from SDSU to farmers, homeowners, and seed companies across the state and region.

SDSU's College of Agriculture and Biological Sciences conducts active breeding programs in nine areas: spring wheat, winter wheat, soybeans, minor oilseeds, corn, forages, oats, woody ornamentals, fruits, and forestry.

The primary intent is to improve competitiveness, profitability, and sustainability of the state's farmers by providing them crop varieties of quality and with higher and more stable yields and with pest and disease resistance and enhanced end use quality.

The goal of SDSU plant breeders is not to compete with private enterprise. Instead, they cooperate in filling the void less served by the private sector.

A few of the breeding programs focus on a "crop" of a different kind, training young scientists. A third contribution of the breeding programs is the enlarged knowledge base about plants and their environments.

In the last 3 to 4 years, SDSU breeders have released or co-released three hard red spring wheats, three hard red winter wheats, three soybean varieties, a new flax variety, some inbred sunflower lines, several inbred corn lines, three new legumes, an arbor vitae, and a pine tree.

Breeders are frequently called upon to change directions in response to crises, as they did in the early 1980s with Guard and Shield to combat destructive Hessian fly infestations in spring wheat. Or they may scale back a program, such as flax when planted acres dropped to about 10,000 acres.

Farmers, via commodity organizations, often provide the input for new research direction in the on-going process of interaction during grant requests, progress reports, and research reviews.

New turns taken recently due to producer input are white corn for the food market, high-oil corn for livestock, white wheat for domestic and export, scab-resistant wheat, soybeans with prescription oil or protein content, and soybeans with resistance to phytophthora root rot and soybean cyst nematode.

"Crop production contributes more than $3.7 billion to the South Dakota economy in one year—and more than $5.2 billion when processing and wholesale trade are figured in," according to a study conducted by SDSU Economist Marty Beutler.

New, higher-yielding varieties are a critical part of that impact. For example, an increase in wheat yields by one bushel per acre can pump a new $15 million, more or less, into the state's economy in one year. This is figured by multiplying 3.85 million acres harvested times a $3.50 price per bushel. Similar calculations can be made for any crop and its new varieties.

These figures make variety development a genuine pocketbook issue for South Dakotans on the farm and in the city, and commodity groups contribute nearly $1 million in checkoff dollars annually to crops research at SDSU to supplement state and federal tax dollars and competitive grants.

For the South Dakota Wheat Commission which administers wheat grow

er checkoff dollars, contributions to research represent 22% of their budget.

Randy Miller, New Underwood, member of the Wheat Commission, said a stream of new varieties "is very important, because world demand increases daily, and if we don't rise to the challenge of meeting that demand we'll create quite a problem.

"New varieties are quite important," Miller continued. "Our production has risen dramatically over the last 40 years, some of that due to farming practices; varieties have surely played a part in that, a very big part.

"Of course—the Wheat Commission—we spend a lot of the growers' money every year with SDSU and its programs to develop new varieties. Those are farmer dollars and we are good stewards of their dollars to use these funds to help them by growing more bushels of wheat."

Other major backers of plant research include the South Dakota Corn Utilization Council, the South Dakota Soybean Research and Promotion Council, the South Dakota Oilseeds Council, and the South Dakota Crop Improvement Association.

SDSU's most comprehensive variety development programs are built around areas of need unsatisfied by private industry, said Jackie Rudd, spring wheat breeder. Private industry can make money developing and supplying corn hybrids. However, private seed developers haven't been able to realize a solid return from wheat varieties in South Dakota, said Rudd.

More than 75% of South Dakota wheat acres are planted to university-developed varieties, according to the South Dakota Ag Statistics Service.

Soybean acres are planted 87% to private and 11% to public varieties. A void among private varieties suited for the shorter-maturing, cooler area of northeastern South Dakota was tackled by Roy Scott, SDSU soybean breeder, whose first release was Hendricks, a Group 0 short-season variety for that area of the state.

Taxpayers and commodity groups get payback for their investment in breeding programs and crops

"(New varieties are) very important, because world demand increases daily, and if we don't rise to the challenge of meeting that demand we'll create quite a problem."

—Randy Miller, New Underwood wheat grower and member, South Dakota Wheat Commission

research, according to Bob Pollmann, executive director of the South Dakota Crop Improvement Association.

Pollmann said "one of the things a new variety will do is to make farming and agriculture more productive and more profitable by meeting the ever changing demands on seed products to adapt to the environment.

"As a result, it keeps our state's number one industry, agriculture, supplied with seed products that are going to meet ever changing conditions.

"Some describe this as shooting at a moving target," said Pollmann. "Diseases and insects are ever changing. That is why one variety can't be used forever and ever. The forces working against it tend to catch up, and then it becomes one that cannot compete.

"New varieties with new defense mechanisms and new stress mechanisms are necessary to compete in a biological world," said Pollmann.

Current SDSU plant breeders:

Arvid Boe, forages
Norm Evers, woody ornamentals
Anne Fennell, fruits
Kathy Grady, minor oilseeds
Scott Haley, winter wheat
Dale Reeves, oats
Jackie Rudd, spring wheat
Pete Schaefer, trees
Roy Scott, soybeans
Zeno Wicks III, corn

As important as new plants, Pollmann added, is the annual variety recommendations list that comes down from the SDSU Variety Recommendations Committee monitoring crop performance on an on-going basis.

"If growers choose to plant varieties recommended over run-of-the-mill varieties, the increase in income will have a marked effect," Pollmann added.

Crop breeding is an interdisciplinary endeavor involving a team effort. "Any breeder will tell you they are not the Lone Ranger out there," said Pollmann. The soybean research team, for example, draws on molecular biologists doing gene transfers, pathologists and virologists screening for disease resistance, weed specialists and entomologists devising control measures, soils specialists looking at fertility, and agronomists studying cropping practices.

Bob Hall heads up the South Dakota Crop Performance Testing Program which tests lines of all crops, private and public, in the far-flung corners of the state. "When they are grown in tests out there, we know what all lines will do. Results are unbiased," said Pollmann.

The "holistic" approach to crop breeding will involve all three missions of the land-grant system—research, classroom teaching and laboratory experience, and Extension specialists and county agents advising farmers.

Crop breeding is a cooperative venture across state lines and also with private enterprise, according to Jack Ingemansen, manager of the Foundation Seedstocks Division at SDSU.

Breeders share germplasm across state lines. In addition, states have cooperative agreements on release of a new variety. "We have a gentlemen's agreement. A minimum of 10% of breeder seed will be shared with a state that is interested in the variety," said Ingemansen.

"Through cooperation, we have access to their material at the same time; we reciprocate with the same courtesy.

"This process allows our growers to have not only the best from our state, but also the best from nearby states

Recent new varieties from SDSU

Hard red spring wheat
Jackie Rudd, principal investigator

Oxen. Awned, early maturing, semi-dwarf, resistant to leaf and stem rusts. Milling and baking qualities are excellent.
Russ. Awned, early-maturing, standard height, Hessian fly resistant. Resistant to leaf and stem rusts. Strong mixing wheat with medium protein content. Named parentage includes Shield, Butte, and Len.
Forge. Awned, standard height, early-maturing. Straw strength and test weight, good. Moderately resistant to stem rust, resistant to leaf rust. Medium protein. Milling and bread-making properties acceptable. Considered a mellow, mixing wheat. Butte 86, Sharp, and Guard parentage.

Hard red winter wheat
Scott Haley, principal investigator

Tandem. Awned, white-glumed, medium-maturity, standard height variety. Excellent end-use quality, characteristics, and good yield performance in its maturity range.
Crimson. Awned, red-glumed (giving Crimson its name), medium-late maturity, standard height variety. Good end-use quality characteristics and superior yield performance in its maturity range.
Nekota (Nebraska-South Dakota co-release). White-chaffed, awned, winter hardy, early semi-dwarf. Moderately susceptible to leaf rust, susceptible to soil-borne and wheat streak mosaic viruses and to Hessian fly. Moderately resistant to stem rust. Good test weight, adequate straw strength. Acceptable bread-making quality.

Soybeans
Roy Scott, principal investigator

Surge (jointly developed by Minnesota and South Dakota). Late group 0, maturing 3 days later than Lambert and 5 days earlier than Parker. Protein content of 44% higher than most varieties in its maturity range, oil content 20%. Resistant to seven races of Phytophthora.
Stride (joint release by Minnesota and South Dakota). Early Group 1 maturity, 2 days earlier than Parker and about 6 inches shorter. Indeterminate growth habit, excellent lodging resistance. Excellent seed quality, protein averages 42%, oil 21%. Shattering resistance and emergence excellent, iron chlorosis tolerance below average. Resistant to seven races of Phytophthora.
Hendricks (joint release by Minnesota and South Dakota). Group 0, matures 2 days earlier than Lambert. Indeterminate growth habit. Resistant to seven races of Phytophthora. Good iron chlorosis rating. Shattering and emergence scores excellent.

Corn
Zeno Wicks III, principal investigator

Yellow endosperm inbred lines developed and released to commercial companies to use in production of hybrids. High-yielding yellow inbred lines are screened for resistance to diseases prevalent in South Dakota. Since 1980, **15 yellow inbred lines** have been released, 4 of which are in widespread use by commercial hybrid producers in the four-state are. Lines are selected to perform under South Dakota's environmental conditions.
Twenty-nine inbred lines of white corn for human food production have been released by SDSU.

Flax
Kathy Grady, principal investigator

Rahab 94. High-oil, yielded exceptionally well in cooperative regional trials. Selected for high oil content from a single plant out of the variety Rahab released in 1985. Averaged 41.3% oil at 18 sites over 11 years, 24.7 bu/A seed yield in 21 location-years testing in South Dakota. Medium late, medium height, much more uniform in height than Rahab. Excellent lodging resistance.

Legumes
Arvid Boe, principal investigator

Remora Canada tickclover. Native perennial legume. Produces large reddish-purple flowers, stems over 3 feet in height. Intended for use in mixtures with native grasses for forage, wildlife habitat, and conservation purposes.
Sundancefoxtail dalea. Native annual legume, erect growth habitat. Intended for forage, green manure, wildlife habitat and food, and conservation purposes.
Sunrise Canada milk-vetch. Perennial legume. Erect growth habit, attains heights of more than 3 feet. In one-cut harvest in mid to late July, yields more than Vernal alfalfa. Intended for use in wildlife habitat plantings and haylands where harvesting is delayed to protect ring-necked pheasant nests.

Woody ornamentals
Norm Evers, principal investigator

Rushmore arbor vitae. Hardy, winter-burn resistant. Narrow, columnar form, blunt top, and dark, glossy green color. Common height is 26 feet with 8-foot spread at base, average growth 11 inches per year.
Tannenbaum Mugo pine. Tree form of Mugo pine. Vigorous small to medium conifer with single leader, pyramidal habit of growth. Needles are dark green. Height after 12 years is 11 feet 4 inches, annual growth about 9 inches, mature height unknown. Selected for urban lots with limited growing space.

and at the same time as it is released into their states. Our growers have as good a shot at the new technology as our neighbors, but perhaps on a more limited basis," said Ingemansen.

That sharing process helped Roy Scott release Hendricks from germplasm obtained from Minnesota and Scott Haley release Nekota, a new winter wheat with Nebraska germplasm. South Dakota growers have these new weapons in their arsenal today.

The plant-breeding effort at SDSU, the state's land-grant university, has been on-going since 1895 when N. E. Hansen joined the staff and began searching the world for plant materials suited to the climate of the Dakotas. Hansen will be remembered for the alfalfas, grasses, and other plants he brought from Russia and Siberia. He and other plant breeders past and present have overcome the biostresses of a harsh climate with new varieties.

New varieties change the landscape, pushing the corn and soybean belts north and west and expanding the wheat-growing area of the state in all directions. ❑

Biostress challenge: stabilizing agriculture with varieties that compete in field and market

South Dakota has double interest in this research—
we produce the crop and we are at high risk
for the heart disease it can prevent

Soy food research is hot topic

by Michelle Rook

Researchers are discovering what the Asian population has known for thousands of years. Soy foods play a role in the prevention of heart disease, osteoporosis, and both breast and prostate cancer.

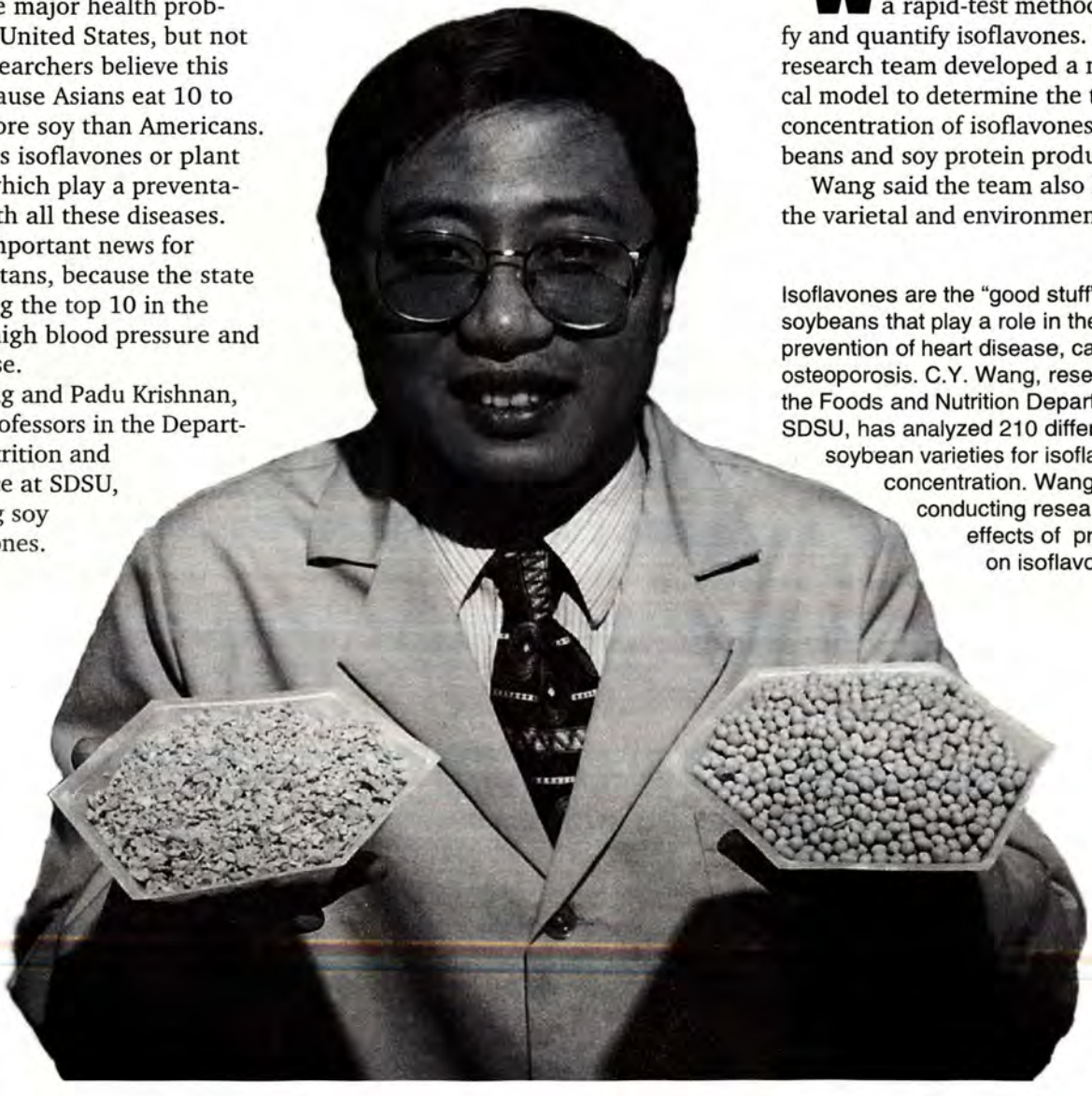
These are major health problems in the United States, but not in Asia. Researchers believe this may be because Asians eat 10 to 50 times more soy than Americans. Soy contains isoflavones or plant estrogens which play a preventative role with all these diseases.

This is important news for South Dakotans, because the state ranks among the top 10 in the nation for high blood pressure and heart disease.

C.Y. Wang and Padu Krishnan, associate professors in the Department of Nutrition and Food Science at SDSU, are studying soy and isoflavones. Their work focuses on three major areas: the chemistry and analysis of isoflavones and other plant chemicals, the effects of processing on isoflavones, and the health implications of soy in the diet. The research is supported by the South Dakota Soybean Research and Promotion Council and the National Research Initiative Program of USDA. It is also part of a 5-year Hatch project.

Wang's first task was to develop a rapid-test method to identify and quantify isoflavones. He and his research team developed a mathematical model to determine the type and concentration of isoflavones in soybeans and soy protein products.

Wang said the team also looked at the varietal and environmental condi



Isoflavones are the "good stuff" in soybeans that play a role in the prevention of heart disease, cancer, and osteoporosis. C.Y. Wang, researcher in the Foods and Nutrition Department at SDSU, has analyzed 210 different soybean varieties for isoflavone concentration. Wang is also conducting research on the effects of processing on isoflavone levels.

photo: Tom Bare

Soy research captures headlines worldwide

Soy research is a hot topic around the world. Dr. James Anderson, author of a paper on the health benefits of soy, published in the New England Journal of Medicine, stated, "Populations that eat generous amounts of soy have fewer heart attacks, lower blood cholesterol, and less cancer."

His research focuses mainly on how soy foods lower the risk for heart disease. He said the isoflavones in soybeans promote vascular health by strengthening blood vessels and lowering blood cholesterol.

Soy also protects against osteoporosis, which annually affects 1.5 million American women. Soy estrogen intake protects against fractures and may even help re-build bones. Dr. Mark Messina, former program director at the National Cancer Institute, said that soy protein is the only protein that does not rob the body of calcium.

"Studies suggest that consuming soy protein beginning at an early age may actually help to prevent osteoporosis," Messina said.

Messina said that it is premature to say soy can replace estrogen therapy, but it is good news for post-menopausal women.

Dr. Stephen Barnes, from the Department of Pharmacology at the University of Alabama-Birmingham, wanted to see if naturally occurring estrogen in the diet alters the risk of breast cancer and prostrate tumors. The project focused on the plant estrogen, genestein, found only in soy foods.

"This one soybean compound appears to lower the risk of cancer substantially by regulating the growth of cells that can turn cancerous," Barnes said.

Barnes reported that the incidence of breast and prostate cancer is very low in Asia but when populations move to the U.S., within a generation they exhibit the same rates of cancer that Americans have, so it is not genetic. "It is how they eat, drink and live their lives." He contends that eating soy foods early in life is important because, "We can't just treat cancer; we have to prevent it."

One of the general conclusions from these experts is that everyone should try to include at least one serving of soy in their daily diet—especially those who are at highest risk. Soy foods can be easily be included in the diet. Food manufacturers offer a variety of soy foods, and they can also be incorporated into recipes and overall meal planning. ❑

tions that promote isoflavones in soybeans, analyzing 210 different varieties from South Dakota.

"The goal was to identify the relationship between isoflavone concentration and agronomic properties such as maturity, yield, seed weight, or seed color," he said. Certain varieties were high in total isoflavones or specific isoflavones. In the future, they also hope to discover what effect soil type and climate have on the isoflavones produced in soybeans.

The second principal research area deals with the effects of processing on isoflavones.

Soy protein concentrate and soy protein isolate are commonly used ingredients in bakery products, various meat products, and even dairy products like soy cheese. Isoflavones can be lost during the processing of soy flour into soy protein concentrate or soy protein isolate.

Wang said most commercial processors use an 80% ethanol wash to remove sugar and other components in soy that may create off-flavors or odors. "Because isoflavones are water soluble, 95 to 99% are essentially washed away during the processing of soy flour into soy protein concentrate," he said. A significant amount of the isoflavones are also lost in the processing of soy protein isolate.

Some processors currently use an acid wash or hot-water wash. Wang and his team are looking at combinations of these options and also at lower levels of ethanol. They also are trying to recover isoflavones from the wash water, which presently is a byproduct.

Many companies are also doing parallel research. Dr. Rasik Daftary is the director of protein research for Archer Daniels Midland. He said the key is coming up with a washing procedure that does not require companies to spend large amounts of money to make major changes in processing or to build a new plant.

Daftary said the public will determine if processing changes are necessary. He wonders if the consumer will pay more for the product just because it contains isoflavones. However, he said, "If you can still maintain the isoflavones (in soy protein concentrate) you can widen your consumer or customer base."

The final research area focuses on the health implications of soy. SDSU is part of a 3-year,

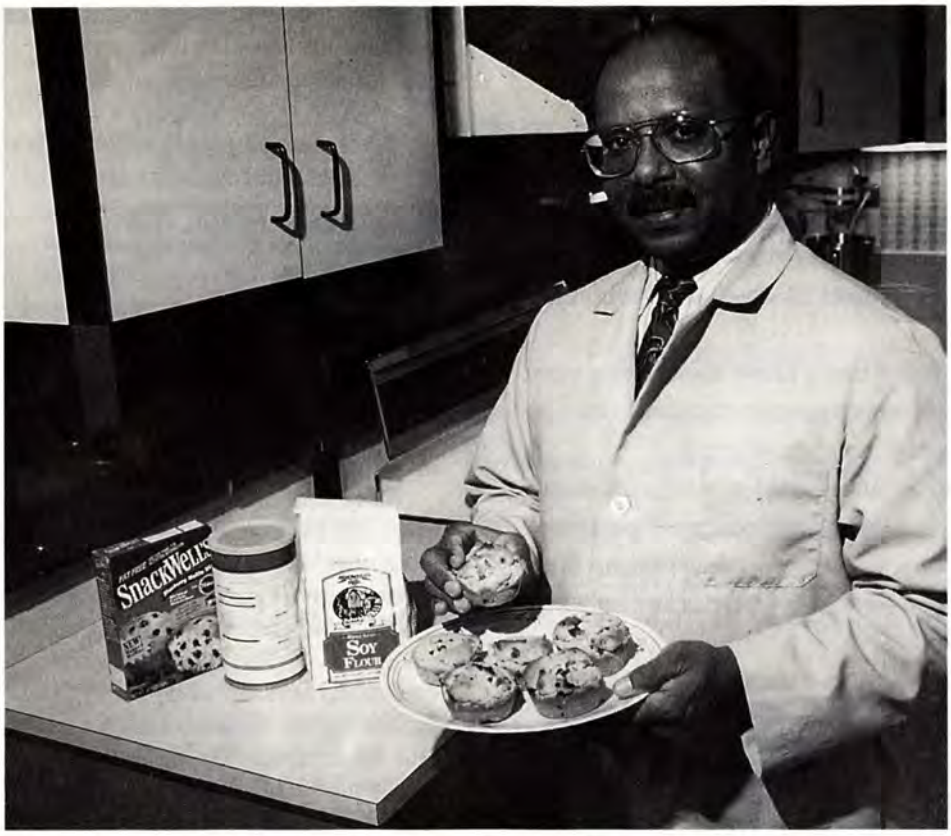


photo: Tom Bare

Padu Krishnan, SDSU Food and Nutrition Department, has developed muffins from a commercial mix, with soy milk and soy flour added. Subjects with hypertension will eat the muffins as part of a cooperative study on how soy foods reduce blood pressure. Krishnan is also developing other soy products, such as a "tofu fudge." Results of consumer testing are promising.

$600,000, joint study with the University of South Dakota School of Medicine, McGreevy Clinic, and CareTrends of Sioux Falls. The five-component project, funded by the South Dakota Soybean Research and Promotion Council, will study how soy foods can reduce hypertension.

The project represents a unique venture among the academic community, private industry, and South Dakota soybean producers. Dennis Hardy, Beresford, chairman of the South Dakota Soybean Research and Promotion Council, said, "If South Dakota soybean producers can play a small part in bringing healthful soy derivatives to light as a source of disease prevention or therapy, then we are pleased to support such efforts."

Researchers at USD will use controlled studies to measure blood pressure and heart rate of people on soy and non-soy diets. Studies will also include the response to soy in individual blood vessels, how soy chemicals bind to cells, and how soy affects the signals and functions within cells.

"If South Dakota soybean producers can play a small part in bringing healthful soy derivatives to light as a source of disease prevention or therapy, then we are pleased to support such efforts."

—Dennis Hardy, Beresford, producer and chairman of South Dakota Soybean Research and Promotion Council

Blood and urine samples of the patients in the study will be screened for isoflavones. Wang is developing the rapid-test method that will be used.

Patients with hypertension have been identified for the project and are given soy muffins, some containing isoflavones, and others without isoflavones. These muffins were developed by Padu Krishnan.

Krishnan and his crew started with a commercial fat-free muffin mix and adapted it by adding soy milk and soy flour. The patients needed a total of 40 grams of soy protein in four muffins to deliver enough isoflavones per day. "Our challenge was to develop a muffin with this extremely high level of soy protein that still had consumer appeal."

Krishnan is developing other "consumer friendly" soy products such as "Tofu Fudge." Consumer panels are tasting and rating the product and selecting a product name from a given list. Krishnan said the overall results are good and provide encouragement for future soy product development.

Krishnan said product development is both a scientific and creative exercise and requires some understanding of human behavior. Although soy is an ingredient in many foods, consumers are not eating enough soy in their diet and are not getting the benefits of soy. "Some of it is access, but much of the problem is psychological. Consumers relate soy to animal feed, not to human food," he said. This makes consumers shy away from eating it and any other food that has disease prevention potential. ❑

Biostress challenge:
improve the health of South Dakotans with a South Dakota crop

Soybean cyst nematode threatens future record crops

Learn the 'three R's'—recognition, rotatation, resistant varieties

by Jerry Leslie

South Dakotans produced a record crop of soybeans in 1997—a whopping 120.75 million bushels that was 32% above the previous record set in 1994.

On the same day this news was breaking, a scientist at SDSU announced that he had identified a serious disease of soybeans—the soybean cyst nematode (SCN)—in nine eastern South Dakota counties.

Very high populations of SCN can reduce soybean yields by 75% or more.

A disease that endangers yields of a crop that now rivals wheat and corn for top cash receipts in South Dakota will turn the spotlight on nematology, the specialty of Jim Smolik, researcher in the Plant Science Department at SDSU.

Plant parasitic nematodes are tiny, unsegmented roundworms. Most live in the soil. Nematodes feeding in or on roots interfere with nutrient and water uptake by the plant, stressing the plant, reducing vigor, ultimately reducing yield.

Because SCN had been present in Iowa and Minnesota for many years, Smolik and others had been looking for the nematode in South Dakota for more than 10 years without finding it. Then in 1995, he and graduate assistant James L. Jones with support from the South Dakota Soybean Research and Promotion Council, initiated a more extensive survey.

One of the fields suggested by Union County Agent John Gille tested positive for SCN in 1995," said Smolik. "Once you have confirmed its presence in the state, interest in the pest increases dramatically."

After that, they located the pest in Turner County in 1996. In 1997, Lincoln, Clay, Moody, Brookings, Hamlin, Grant and Day counties were added to the list. Smolik suspects SCN is even more widespread and probably has been here 10 or 15 years.

As part of his master's thesis, Jones established plots in 1996 with cooperators in a heavily infested field in Union County to assess impact of SCN on yields under South Dakota conditions. The plots compared yields of resistant and susceptible varieties, including public, private, and experimental varieties. Yields of resistant varieties were 25 to 100% higher than susceptible varieties.

Some of the 1997 plots in Turner County were irrigated, allowing Smolik to measure yield losses under both dryland and irrigated conditions. Under dryland conditions, high numbers of SCN dramatically reduced yield. With moderate populations in both irrigated and dryland fields, resistant varieties yielded about 30% higher than susceptible.

The effects of very low and high SCN numbers were compared in an irrigated field. Very low numbers had no impact on yield, while high numbers reduced yields 45%.

Test plot results demonstrated that SCN poses a serious threat to South Dakota soybean production.

Smolik also is continuing to screen the lines in Roy Scott's breeding program for SCN resistance.

Having found SCN in nine counties, and expecting it to show up in more, SDSU's job now is to spread the word to soybean producers so they can look for SCN symptoms on their farms, test for it, and if needed learn how to manage it, said Smolik.

"Our tests over the last 2 years have convinced us that if you do not proper

photo: Tom Bare

Jim Smolik examines roots of a susceptible soybean in a non-irrigated portion of a field with very high soybean cyst nematode (SCN) populations. Yield of the susceptible variety was 5 bu/a, while yield of the resistant variety in the background was 23 bu/a. In most cases SCN damage is not this obvious. Inset photo shows cysts on the roots.

"There is a lot more of it (SCN) around than you realize .... If you break it up with 2 or 3 years of corn you may not have to plant resistant beans."

—LaRahn Hagena, Davis

ly manage SCN it will manage the soybeans for you."

Smolik will not be alone in this effort. Extension plant pathologist Marty Draper has begun presenting programs on SCN to producers. The land-grant university network of county Extension agents in soybean counties also has taken up the campaign.

Soybean farmers themselves are helping through their checkoff investment administered by the Soybean Research and Promotion Council which helps fund Smolik's work.

LaRahn Hagena of Davis has been raising soybeans for 25 years and knew he had some kind of problem but didn't know what it was. "Going by my yield maps, I can see somewhat where my hot spots are," said Hagena who has a yield monitor and global positioning equipment on his combine.

Hagena has cooperated with Smolik, allowing test plots on his farm in Turner County. "I'm glad I found out what it was before it was too late."

Of Smolik's research, Hagena said, "You've got to have somebody find out what's going on and make it work. I've learned a lot by it and I think some others did around the area," said Hagena of the SCN test plots on his farm.

"There is a lot more of it (SCN) around than you realize; some pockets are yielding less," he said. His yield maps show clearly where's he's planted soybeans on soybeans. "You just can't do that," he said. "If you break it up with 2 or 3 years of corn you may not have to plant resistant beans."

Help for soybean farmers with SCN will come from the entire SDSU soybean research team, including Roy Scott, soybean breeder who has some promising lines that carry resistance to SCN. Some of these are nearing release. These lines, however, are not adapted for the northern part of the state which so far has no resistant varieties available. Scott and Smolik will be looking for short-season varieties with SCN resistance.

In the effort to inform growers, Smolik has published a fact sheet on the nematode, ESS 44-11, available at county Extension offices.

Smolik outlines what soybean farmers need to know about SCN:

• Very low populations of SCN often escape detection and, in a corn-soybean rotation, it may take 6 to 10 years after SCN is introduced for the nematode to reach damaging levels.

• One of the indications that this nematode may be present is declining soybean yields in portions or all of a field. Other symptoms include stunting, yellowing, and early maturity.

• The presence of SCN can be confirmed by observing cysts attached to roots or by submitting a soil sample for cyst analysis. In most years cysts can be observed on roots from mid-July through mid-September.

• Once SCN has become established, there is no practical way to eliminate it from a field. It can, however, be effectively managed through the three R's: 1. Recognition of the problem. 2. Rotation with a non-host crop. 3. Resistant varieties.

• Non-host crops include corn, sorghum, small grains, sunflower, canola, and alfalfa. Dry beans are a good host for SCN and should not be rotated with soybeans. Populations of SCN will remain high in a corn-soybean rotation unless resistant soybeans varieties are used. Avoid following soybeans with soybeans.

• The soybean cyst nematode moves with anything that moves soil, including tillage and harvest equipment, wind and water erosion, and soil peds in seed stock.

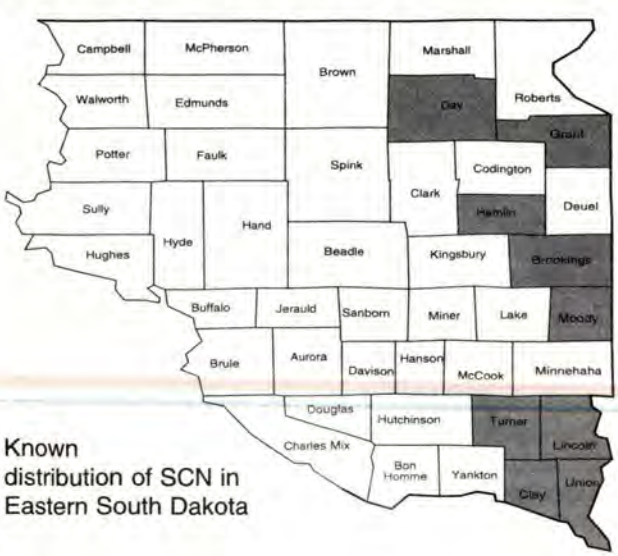
• Cultural practices that reduce wind and water erosion also will slow the spread of SCN. Plant only properly cleaned seed.

SCN, thought to have been imported from the Orient, was first found in the southeastern states in the early 1950s and has progressed north to where it is now a problem in most of the soybean-growing states of the Midwest.

Smolik sizes up the situation this way: The increased acreage planted to soybeans in South Dakota has resulted in the loss of crops once included in rotations. This in turn results in a shorter interval between soybean crops, and the net effect is a reduction in crop diversity. Lack of diversity in cropping systems often results in very serious pest problems such as SCN.

The first step toward managing this pest is awareness of its presence. Soybean growers now can begin to manage around the nematode.

They will find willing helpers in their efforts in Nematologist Jim Smolik, Extension Plant Pathologist Marty Draper, the entire SDSU soybean research team, and their outreach partners in the county Extension offices. ❑



Known distribution of SCN in Eastern South Dakota

Biostress challenge: assuring yields stay high by leading counterattack on serious soybean pest

Peace Fellowship gives SDSU student experience in arid lands agriculture

by Michelle Rook

photos: International Arid Lands Consortium and Kevin Kleinjan

While in Israel as an International Arid Lands Consortium Peace Fellow, Kevin Kleinjan, (above, center) spent a month studying satellite maps of the Negev desert (far left) and matching them to soil samples he'd taken. Kleinjan says western South Dakota is very similar to portions of Israel.

Today's agriculture is a global industry, and the sharing of information between counties can break down political and cultural boundaries and help feed the world. That concept was never more evident to Kevin Kleinjan than when he traveled to Israel.

Kleinjan, an SDSU landscape design and geography major from Brookings, was the first student from SDSU to travel to Israel through the International Arid Lands Consortium (IALC) Peace Fellowship program. The fellowship is designed to promote arid lands research and to contribute to the Middle East peace process.

The IALC is a partnership of organizations dedicated to developing new methods of combating desertification. Member institutions include the University of Arizona, New Mexico State University, South Dakota State University, Texas A&M University-Kingsville, the University of Illinois, Desert Research Institute, UCCSN, Nevada, and the Jewish National Fund.

For his fellowship, Kleinjan spent a month at the Sede Boker Desert Research Institute in Israel studying desert soil profiles. Remote satellite sensing imagery gave him a "smart map," images of the earth and soil and the different levels of vegetation according to a "vegetation index." A satellite map allows researchers to delineate crop areas and evaluate the intensity or vigor of the plants.

Kleinjan matched the satellite pictures of the desert region with soil samples he had taken in the same areas. He found the satellite images biased in arid lands because the brightness of the soil can show up like plant cover, confusing satellite imagery results.

"Our efforts were to make it less confusing, so that when taking satellite images we can pull out the soil from the vegetation better, so they can do a better job of monitoring vegetation," he remarked.

Kleinjan's work was part of a much bigger project. "Their overall goal is to maximize each raindrop that falls....to have as little as possible wasted and know where to plant to optimize what moisture does fall," he said. This also provides clues for scientists on how to modify the climate by using methods such as planting trees to make the land less arid and more lush.

According to Kleinjan, the Negev Desert is one of Israel's largest resources, but receives only 90 millimeters of rain annually, the equivalent of 3.54 inches. The desert "is 60% of their land, but only one tenth of the people live on it, so their goal is to find a way of producing more and more of their food in the Negev which has so far been mostly a wasteland," he stated. Most food production is on a small amount of land in the northern region along the Mediterranean Sea.

Western South Dakota is very similar to parts of Israel, according to Kleinjan, especially when you compare the need to conserve moisture. "In Israel they use farming methods to capitalize on the amount of rainfall that falls using different things for soil retention similar to our post-war efforts...building little check dams and things like that." However, he adds Israel farmers also use modern technology like U.S. farmers.

In addition to broadening his knowledge of soil science, Kleinjan learned many cultural lessons. "They're very proud of their land and starting to really focus on conservation efforts and reforestry." He said it was interesting to see nomadic people co-existing with modern day civilization. He also found the tensions between the various cultures were not as evident as newscasts had led him to believe.

Kleinjan encourages other students interested in international agriculture to apply for the fellowship. Ideally, he said, IALC wants students to spend a semester or summer session working with scientists on projects sponsored by the Consortium.

David Mills, agronomy and horticulture major,will be an IALC peace fellow in the summer of 1998. ❑

Biostress challenge: thinking globally, sharing information, breaking down political and cultural barriers

Research sheds light on fall lambing

When ewe's biological clock is reset, advantages are higher market lamb prices, improved winter feed use

by Jennifer Hyde

A ewe's biological time clock tells her she should breed in the fall and lamb in the spring. Consequently, all the year's lambs flood the market at the same time.

Getting ewes to lamb out of season will give producers a year-round, market-ready lamb crop.

Lowell Slyter, sheep researcher at SDSU's Department of Animal and Range Sciences, has been working on that theory for a number of years.

Slyter says lambs born in September and October more than likely are ready for market in January and February, the traditional lambing months. Prices are better at these times, and markets theoretically become more stable with year-round supplies.

With that goal in mind, Slyter hopes his research will increase profit opportunities for producers.

And there are additional benefits from fall lambing, he adds.

But try telling a ewe she needs to completely change her reproductive schedule.

Slyter selected breeds for the reproductive traits that would fit his research. Cross-bred ewes are more fertile and have higher reproductive rates, so he developed a cross-bred population of Dorset, Finn, and Targhee.

The Dorset was selected for its traditional long breeding season, while the Finn was chosen for high lambing rates. He picked the Targhee for hardiness, mothering ability, and wool quality. These ewes are bred back to rams of the same cross.

The process sounds simple enough, but the sheep hadn't read Slyter's research proposal. Just putting rams and ewes together in the spring does not result in good lambing rates.

Because sheep naturally breed in the fall, they are considered short-day breeders. Therefore, Slyter put maiden ewes under extended light periods during the mid-winter months, from December 1 to February 10.

When the ewes are exposed to artificial light in mid-winter and are cut back to a shorter light period in February and April, their biological clocks seem to be telling them that they actually are breeding in the fall during shorter days, Slyter says. He achieves higher conception rates at the April breeding because of the mid-winter, long-day simulation.

In long-day simulation, timed lights are set up in the building where the ewes are kept. Starting December 1, the lights come on at 4 p.m. and shut off at 1 a.m. The sheep are in the dark until 7 a.m., when natural light takes over. This is 18 hours of light and 6 hours of dark.

Intensity of the lights doesn't have the impact that length of light exposure does, said Slyter.

Ewes received 16 hours of light starting in early January the first year Slyter ran the experiment. The second and third years, he upped treatment to 18 hours with a start date on December 1.

Lambing rates climbed every year, with a big jump when Slyter increased the light period. By the third year, 84% of treated ewes and 57% of control ewes were lambing.

Slyter says control ewes improved because both groups were exposed to the same rams at the same time to equalize ram effects.

"Cyclic activity in ewes tend to create cyclic activity in other ewes," Slyter said. "The more you have cycling, the more that will cause the other ewes to cycle."

Older, more mature ewes do well in the system. The biggest problem with first-lamb ewes has been getting them to lamb for the first time in the fall, Slyter said.

When the trial began, April-born ewes from the Antelope Range Livestock Research Station near Buffalo were brought to Brookings and bred the following April at about 12 months of age to lamb in the fall.

Lambs from that crop were bred the next April at 7 months of age, to lamb at about 12 months of age. All ewes retained for the fall breeding program were born in the fall. Fall breeding genetics are the genetics Slyter is selecting for.

The flock is a closed population, which means replacement animals come from within the flock. No outside animals are used.

Rams are selected based on multiple births and early lambing ewes, hopefully giving these traits to their offspring.

Slyter said another study is pending. He would keep the control ewes in separate pens from treated ewes, eliminating the associative effect of cycling ewes causing other ewes to cycle.

Eventually, he hopes to breed ewes in the fall without using the light treatment. Once ewes get on a fall breeding schedule, they usually stay there.

Enough fall lambs are generated so a ewe who doesn't cycle is replaced by another. Heavy pressure is put on the ability to lamb. Every year, one third of the ewes are replaced in order to quickly capitalize on genetics. This means that the mature ewes at their peak of production are sold to reduce the generation interval and maximize genetic improvement, just the opposite of what a producer might do.

The Antelope station hasn't had as much success with the program as the Brookings station. Slyter said this could be due to management differences. Feed resources at Antelope are limited, which also plays an important role. His expectations for the Buffalo station were lower, so he is still pleased with results.

When born in September and October, lambs can generally be weaned in December. Through the

photo: Tom Bare

Lambs born in the fall will likely be ready for market in January or February, the traditional lambing months, says Lowell Slyter, SDSU sheep researcher. Prices are better at that time. Lights were used to convince ewes about the amount of daylight and jumpstart their biological clocks.

coldest part of the winter, Slyter said, producers would be feeding a dry ewe with lower nutritional requirements rather than a pregnant ewe with high nutritional requirements.

On range, feed is scarce during these winter months. The producer could skip looking for high quality feeds.

There are other advantages to fall lambing. Losses related to hypothermia are not present. Survival rates are higher in the fall, although there is a lower lambing rate, lower because breeding and lambing in the fall still seem to go against the ewe's natural time clock still ticking somewhere inside her.

"Ovulation rates are not as high," Slyter said. "We hope to overcome that with our selection. As we select for multiple births out of the fall lambing ewes, over time, we think we will pick that up."

Slyter says fall lambing will soon be a viable option for producers. "It's won't come rapidly, but the advantages call for this option." ❑

Biostress challenge:
creating a stable, year-round lamb market

'Senior seminars' highlight global ag issues

Students sharpen argumentative skills, use class to broaden their mental horizons

by Jennifer Hyde

photo: Tom Bare

In senior seminar class, students debate and discuss important ag issues. They need to research topics and understand viewpoints beyond their personal experience. The seminar helps students develop critical thinking abilities that will prove valuable later in life.

Agriculture has no time for daydreamers anymore. Time was, when following the team or keeping the tractor on a straight course, the farmer could let his mind wander a little. He fed his family with his farm-grown crops and animals, and then he sold the rest at the local elevator or sale barn.

Today, agriculture is global. The farmer, in the cockpit of his combine, is mapping his field for soils, yield, and weeds while listening to the regional markets, following the stock markets in Tokyo and Wall Street, calling out on the phone and arranging to buy into a new farmer cooperative. His crops and livestock are marketed—there is no town locker plant anymore—and the family buys its food in the chain grocery store like everybody else. His agriculture has become a business.

It is also highly political. The agriculture world is filled with controversial issues. Today's farmer must attend community meetings, apply for permits, prepare 5-year plans. What he does affects his neighbors and people downstream and in Washington. Issues he faces have become more widespread as the industry has moved from small-time farms to large-scale businesses.

He can learn enough to get along in today's complex agricultural world by trial and error. But tomorrow's agricultural world will be even more complex and global. Can SDSU help his sons and daughters step successfully into that agriculture?

The answer is "yes." The ability to think critically and to do research before acting is taught with as much seriousness in College of Agriculture and Biological Sciences classrooms as are the facts of agronomy, ration formulation, or any other subject matter.

"(The class) helped me think for myself and decide what my opinion was on these issues."

—LeRoy Ness, Jr., Kimball, May 1998 graduate

Senior animal science majors, for example, are required to take a course designed to improve those skills. In senior seminar, they debate and discuss and dissect an important agricultural issue once a week.

The issues are chosen by the students at the beginning of the semester. Two students are assigned to each topic; one is for and the other is against the issue. Their arguments are judged by peers as well as professors.

Senior seminar was implemented about 8 years ago. Faculty had noticed that students were very limited in their outlooks and were very one-sided in their discussions of current issues.

James Males, head of Animal and Range Sciences, teaches senior seminar. "Students weren't taking a very broad view of controversial issues," said Males.

"We developed this idea for a one-credit debate course to address contemporary issues."

Feedback from students was extremely positive after the first year.

Males said students didn't realize the breadth of agricultural issues. Many didn't understand how much information they really needed to argue their side effectively.

This is the fourth year that senior seminar has been required, and student feedback continues to be positive, Males said.

"For the last 3 or 4 years, our academic quadrathalon team has won the oral presentation section of competition at the Midwest Animal Science meetings."

This shows SDSU students are a lot more comfortable and are better prepared to make arguments and discuss these issues, he said.

Potential employers have told Males that they want students who are familiar with important issues facing agriculture, he said, adding that this course offers that knowledge.

LeRoy Ness, Jr., said the class helped him learn how to deal with current issues.

"It helped me think for myself and decide what my opinion was on these issues," said Ness of rural Kimball.

And, "You learn how to communicate in a manner where your opinion is expressed without making others defensive," said Roxanne Kenzy, a May 1996 graduate from Iona.

Kenzy, now working at Consolidated Feeds, L.C., Omaha, said the class was a good confidence booster, and it was interesting to learn the opinions of people from different states.

Tyler Fritz, Belfield, N.D., agreed with Kenzy. "I learned how other people look at things and why they look at them that way."

Researching skills are an important part of the class. Topics must be backgrounded thoroughly to find facts supporting the issue. Research also must be done to acquire ammunition for rebuttal to the opposing side.

"Learning how to use the Internet to research my topic was very valuable information," said Heidi Reis, Reliance. "I think Internet use is going to be an important part of the agriculture world, more than it already is."

For some students, the class was a real eye-opener.

"I learned lots of things about the issues that I never knew or even thought of before," said Fritz.

Jill Heemstra, a May 1994 graduate from Dolton, believes some students benefited more than others from this class.

"Some people are exposed to lots of new ideas, keep up on current events on their own, and just enjoy learning. These are the people this class probably does not benefit," said Heemstra, who is now working for the University of Nebraska, Lincoln.

"These people are just perfecting skills they already possess, like being able to present information and pick out important ideas from a story."

Heemstra said other people are the exact opposite. "They know very little outside their own world, and they spend very little time and effort, and this class may actually push some of them to consider things outside their own little world."

Overall, the class was considered well-constructed and well-thought-out. "I think this class was set up very well. It was a relaxing environment, and a lot of good discussion took place," said Reis.

The measure of the success of a class is whether students feel they want to be pushed harder. Some felt the class needed to meet more than once a week for more of an impact. "If I could change the class, I would make it a three-credit class meeting three times a week," said Fritz. "I would also like to see more open speaking about more topics."

"Perhaps if it were a full three-credit course that covered interpersonal skills and leadership skills, too, it would become a more valuable experience as far as the job world goes," said Heemstra.

"Find an expert that is affected by the issue and have him or her come in and talk to the class," offered Kenzy.

"I thought the class was a valuable experience because it helped me learn to prepare a presentation, and it was great to be able to talk to other people that have the same concerns," said Ness.

People in production agriculture are going to find that someday they will have to go before zoning boards and county commissioners, Males said. They will have to talk to their neighbors and convince them that they can expand their livestock operation or put in drainage tiles or gain an easement of some sort.

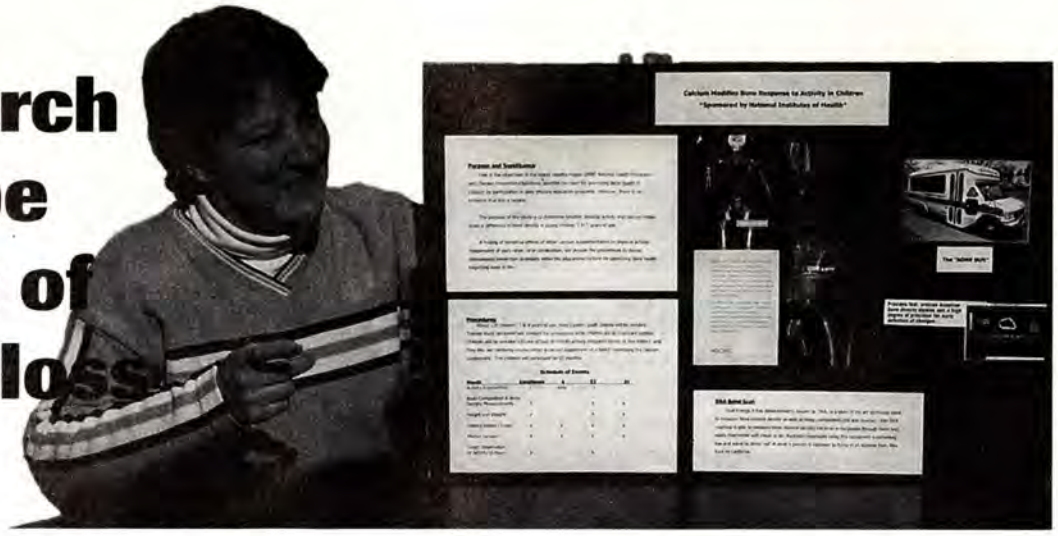
"I think a course like this can only help them in knowing where to go to find information and know a little bit more about some of the arguments that are going to be used for and against them in those kinds of settings."

The real pay-off from senior seminar may be for students that go back to the farm and ranch, Males said. ❑

Biostress challenge:
meeting "real-life" controversies face-to-face in the classrooom

New research will probe mysteries of bone mass loss

by Larry Tennyson



The bone mass studies of children being conducted by Bonny Specker may lead to answers to the mystery of brittle bones in older adults. If the growth of bone mass can be optimized, the onset of brittle bones, and the health risks that come with them, can be significantly delayed.

SDSU is about to begin exploring the mysteries of bone loss in older adults through a million-dollar grant from the National Institute of Health.

Lead researcher and project director for the effort is Dr. Bonny Specker, director and chair of the Ethel Austin Martin Endowed Program in Human Nutrition.

The loss of bone mass in older adults produces something we often refer to as "brittle bones," a risky condition in which bones fracture easily.

Bone mass develops until an individual reaches the age of 20-30 and then declines from this peak for the remainder of life. Men generally develop more bone mass than women, and this delays the age at which bone becomes susceptible to fractures. So, if ways can be found to optimize the growth of bone mass in both men and women, the onset of brittle bones can be delayed significantly.

"We already know that calcium supplements in the diet as well as exercise can offset some of those negative effects. Our initial goal here at SDSU is to measure the effects of exercise and dietary calcium among younger children who are in the process of developing their bone mass. This approach differs from much of the previous research that has emphasized work with older individuals who are in a mode of declining bone mass," Specker explained.

The reason exercise makes a difference in bone mass is that it stresses bones, which, in turn, respond by growing bigger and thicker. A diet rich in calcium also is known to produce more bone mass prior to puberty.

The question is: will a combination of exercise and dietary calcium in children aged 3 and 4 produce the optimum amount of bone mass by the time the individual reaches the age of 20-30?

Studies in adult women suggest that exercise doesn't optimize bone mass unless there is sufficient intake of dietary calcium. Similarly, dietary calcium by itself doesn't yield a satisfactory result either.

Specker will look at approximately 220 young children in child care centers throughout eastern South Dakota. Half of the children will be given a half hour of gross motor exercise each day for 5 days each week over an entire year. Half of that group also will be given a calcium supplement, and the other half will be given a placebo that looks like the supplement but isn't. The remainder of the children will be given a half hour of fine motor skill exercise consisting of arts and crafts over the same year-long period. Again, half of that group will receive the calcium supplement, and the other half will receive the placebo.

At the beginning and the end of the 12-month period, all children will have their bone mass measured. This should indicate the effects of the four types of treatment on the growth of bone mass.

But the study doesn't end there. A second measurement a year later will determine how much of the growth was permanent and how much was lost.

Most of the grant will be used for personnel costs. Each child care center will have someone who will do both the gross motor exercises and the fine motor exercises with the groups of children. Two coordinators also will monitor the physical activities and quantify it for each individual child.

"This is only the beginning," Specker said.

Another research possibility in South Dakota relates directly to farm and ranch operators.

Is the bone mass of men in agriculture who have seasonal differences in physical activity affected by these differences, and do more fractures occur at certain times of the year? And are there bone mass differences that can be traced to the type of farm or ranch enterprise? For instance, does the consistent physical activity related to a dairy operation result in less bone loss for its operator than, say, the more sporadic physical activity of a cow-calf operation or a wheat operation?

And, because there are regional differences in farming and ranching operation types, does this translate into regional differences of susceptibility to bone fractures?

Yet another highly speculative study may be in infants.

It is felt by some researchers that the bodies of babies who receive a lower amount of calcium early in life are somehow predisposed to conserve calcium when the child reaches adulthood.

A study in England among premature infants found that those fed human milk had a greater amount of bone mass by the time they were 7-8 years of age. Human milk is lower in minerals, including calcium, than either cow's milk or formula.

"There may be something early in life that programs us in how we'll handle minerals later in life," Specker observed. ❑

Biostress challenge:
discovering how to hold off onset of "brittle bones" and keep South Dakotans healthier

Master Gardeners turn from hobbying to helping

When the questions start coming thick and fast, county agents ask their local experts

by Jody Heemstra

Brookings resident Mary Roduner has enjoyed being in the garden since she was 6 years old. She also likes working with people. That's why she decided to become a Master Gardener 4 years ago.

Codington County Extension agent Chuck Langner gets several calls dealing with horticulture and gardening on an average day.

"I'd say, during the spring through the fall, on an average day, calls and people coming into the office would be somewhere around 20 to 25 a day."

Master Gardener Coordinator David Graper, Extension horticulturalist says the number of questions agents receive is why the program started in South Dakota and why SDSU has been involved since the first class was held in DeSmet 10 years ago.

The answers for those questions originated in Experiment Station research, flowed through Extension specialists and agents, and ended up in the massive notebooks handed out at Master Gardener classes.

Leon Wrage, Extension weed specialist, adds that the program gives people an unusual opportunity.

"It allows for much more complete training and provides an exceptionally comprehensive reference to a group of people that have an interest and are committed to doing something with this information."

> *"People think they have to know everything about everything before they start taking (Master Gardener) classes, but they don't. They just have to want to learn."*
>
> —Mary Roduner, Brookings, Master Gardener

The Master Gardener training that Mary Roduner, Brookings, received has enabled her to take a lifelong love of gardening to a higher level and to help other people with gardening problems in the process.

photo: Tom Bare

Although Roduner did have some background in gardening when she started taking the classes, "you really don't have to know anything when you start," she says.

A common misconception about becoming a Master Gardener, Roduner says, is "people think they have to know everything about everything before they start taking classes, but they don't. They just have to want to learn."

She says most people would be surprised at what they already know about gardening or horticulture.

"You don't garden for many years without doing something right because if you did it wrong every year, you'd quit."

"Right after winter" is a very busy time for Roduner. "When things are leafing out. Why didn't this plant grow? What should I do with that? Is this a good time to transplant? A lot of those types of questions."

But South Dakota's almost 400 active Master Gardeners can be busy all year round.

Brookings County Master Gardeners, for example, will head up a new community group called Dirty Knees: Friends of McCrory Gardens.

"We think there's a lot of people out there who like to do garden work, but just don't have access to a garden. So, anybody that wants to come out and help will be welcome."

McCrory is the source of many of the gardening "answers" Master Gardeners and the many visitors to the Gardens take home with them. Its research plots actually cover many more acres than its more showy flower beds.

The new group will help the McCrory staff tend tree, shrub, and grass research plots and the annuals and perennials being evaluated for their hardiness as well as displayed for their beauty. Generally, they will "learn while doing whatever needs to be done."

Other Master Gardener groups also may concentrate on projects localized to their counties, identifying plants or doing special projects such as landscaping around buildings, judging 4-H projects, or giving talks to various clubs.

Graper says the topics covered during training include disease, insect, and weed management; lawn, tree, and shrub care; basic landscaping; tree and shrub identification; safe use of pesticides; soils; introductory botany; how to handle plants; roses and herbs; and fruit and vegetable production.

Graper says the instructors use examples to make things easier to understand and identify. They also teach techniques to make it easier to discover what's wrong with a plant or lawn.

"We try to teach the Master Gardeners that they need to look for patterns and gather lots of information from the client before diagnosing any problems," Graper says.

"We talk about all aspects of weed control," Wrage adds. "We have demonstrations of different kinds of tools and techniques for hand and mechanical weeding. For example, there is a right and wrong way to hoe in a garden."

Classes are also shown some of the latest in gardening equipment, including new machines and tools adapted for use by partially handicapped people who who would like to spend time in their gardens.

Classes are offered each spring at three different locations throughout the state, with 15 to 35 people in each class. Sessions are once a week for 8 weeks and cover two topics at each session. A class costs $125 if the student agrees to help the county agent—without pay—for 50 hours, or $350 if the student doesn't want to volunteer the 50 hours.

"The main thrust of the Master Gardener program is to find interested people willing to put in a commitment of time to take the training, but then also to follow through and give those payback hours," Graper says.

After completing their training, Master Gardeners are put on a mailing list so they can keep up with new information. Update training is offered every year but isn't required. The location of the training rotates each year, with every third year being in Brookings.

The first classes for 1998 will be offered in March. Contact your county agent for sign-up information and deadlines. ❑

Biostress challenge:
training volunteers to use research-based information to help their communities

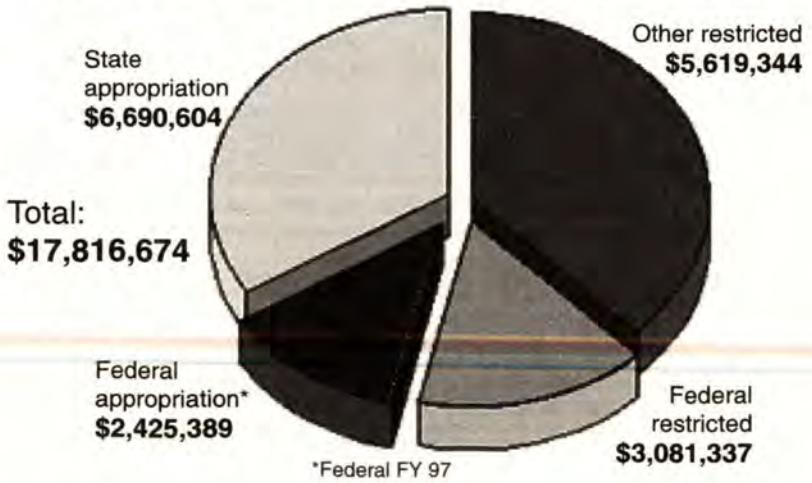
110th Annual Report

South Dakota Agricultural Experiment Station

will be available on the World Wide Web at
http://www.abs.sdstate.edu/abs/aes.htm
in February, 1998

Budget

Agricultural Experiment Station • For July 1, 1997 to June 30, 1998



SOUTH DAKOTA STATE UNIVERSITY
College of Agriculture and Biological Sciences
Agricultural Experiment Station
Brookings, SD 57007
Fred Cholick, Director

Penalty for Private Use $300
Publication

Non-Profit org.
U.S. Postage
PAID
Brookings, S.D.
Permit 24

Address Correction Requested

DONALD M MARSHALL
ANIMAL & RANGE SCIENCE DEPT
2170
ASC

CM 01/21/98

Calendar of Events

Date	Event
JANUARY - 1998	
8-10	SD Pork Producers Council Annual Mtg & Trade Show, Ramkota, Sioux Falls
16-17	SD Farm Bureau - Young Farmers & Ranchers Conference, Chamberlain
17	Lamb Bonanza, SDSU, Brookings
27	Southeast Farm Annual/Advisory Board Meeting, Beresford
FEBRUARY	
7	4-H Clover Classic - Pork Classic SDSU, Brookings
9	Beef Day at Legislature, Pierre
10	Highmore Annual/Advisory Board Meeting
23-25	Crop/Pest Conference, Watertown
26	Commodity Outlook, Brookings
MARCH	
5	Dairy/Forage Conference, Brookings
12-15	4-H Conference, Kansas City, MO
23-25	SDSU Nutrition Seminar, Brookings
APRIL	
1	Annual Crop Consultants Workshop, Brookings